عنوان مقاله:

Utilization of Gene Expression Programming for Modeling of Mechanical Performance of Titanium/Carbonated Hydroxyapatite Nanobiocomposites: The Combination of Artificial Intelligence and Material Science

محل انتشار:

ماهنامه بین المللی مهندسی, دوره 34, شماره 4 (سال: 1400)

تعداد صفحات اصل مقاله: 8

نویسندگان:

M.R. Shojaei, - *Department of Materials Science and Engineering, Sharif University of Technology, Tehran, Iran*

G.R. Khayati - *Department of materials science and Engineering, Shahid Bahonar University of Kerman, Iran*

A. Hasani - *Department of Materials Science and Engineering, Sharif University of Technology, Tehran, Iran*

خلاصه مقاله:

Titanium carbonated hydroxyapatite (Ti/CHA) nanobiocomposites have extensive biological applications due to the excellent biocompatibility and similar characteristics to the bone. Ti/CHA nanobiocomposite has good biological properties but it suffer from diverse characteristics especially in the hardness, Young's modulus, apparent porosity and relative density. This investigation is an attempt to propose the predictive models using gene expression programming (GEP) for the estimation of these characteristics. In this regards, GEP is used to model and compare the effect of practical variables including compact pressure, Ti/CHA ratio and sintering temperature on their investigated properties. To achieve this goal, ۹۰ different reliable experiments were considered to create the GEP models. Selected data set were divided randomly into ۶۳ training sets and ۲۷ testing sets. Finally, ۵ of the best models reported for each different output. Sensitivity analyses are done to determine and rank the practical parameters on each investigated properties and revealed that wt.% Ti, wt.% CHA, Compaction pressure (MPa) and Temperature (°C), respectively are the most effective parameters on hardness, Young's modulus, shear modulus, apparent porosity and relative density. By comparing the results, a very good agreement was observed between the experimentals and the results obtained from GEP model.

کلمات کلیدی:

Ti/CHA nanocomposite, mechanical alloying, Powder Metallurgy, Biomaterials, Gene expression programming